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AUTHOR	Snyder, Conrad Wesley, Jr.; And Others
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ABSTRACT

Two papers on classroom teaching techniques and classroom environment in Botswana are presented. The first paper, "Is Teacher Training Associated with Teachers' Classroom Behavior? A Study of Botswana Junior Secondary School Teachers" by David W. Chapman and Conrad W. Snyder, Jr., investigates the extent to which teaching behaviors differed across 212 teachers with different levels of formal preservice teacher training. Results indicated that the level of training (untrained, diploma, bachelor's degree, or postgraduate degree) accounted for 25 percent of the variance in the predictor variables. Groups did not differ much on use of feedback, class discussion, small group discussion, and overall use of questions. Untrained teachers gave greater attention to lesson preparation and student development. The second paper, "Classroom Affect and Complexity: Ecological Perspective of Botswana Junior Secondary Schools" by Conrad Wesley Snyder, Jr. and others, asserts that affect valuations can accurately reflect the qualities of academic environments. Observation of 603 Botswana classrooms of 212 teachers at the junior secondary level resulted in ratings of 8 affect and structural scales: complexity of the instructional approach, lesson difficulty for students, student uncertainty about lesson concepts, teacher satisfaction, student satisfaction, student interest, teacher enthusiasm, and student attentiveness to instruction. References accompany each paper. (JDD)

RESEARCH REPORTS

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Is Teacher Training Associated with Teachers' Classroom Behavior? A Study of Botswana Junior Secondary School Teachers

Classroom Affect and Complexity: Ecological Perspective of Botswana Junior Secondary Schools

Conrad Wesley Snyder, Jr.
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Bruce Fuller

December 1991

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Jerry L. Messec, Director
Educational Efficiency Clearinghouse
IEES
Learning Systems Institute
204 Dodd Hall
The Florida State University
Tallahassee, FL 32306-4041
USA
Telephone (904) 644-5442
FAX: (904) 644-3783

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Classroom Research in Botswana:

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I. Is Teacher Training Associated with Teachers' Classroom Behavior? A Study of Botswana Junior Secondary School Teachers

David W. Chapman, State University of New York at Albany
Conrad W. Snyder, Jr., Florida State University

Is Teacher Training Associated with Teachers' Classroom Behavior?

A Study of Botswana Junior Secondary School Teachers

David W. Chapman
State University of New York at Albany

Conrad W. Snyder, Jr.
Florida State University

Declining school quality has been identified as one of the most serious problems facing many Third World countries—particularly in Africa. The quality decline is the result of a rapidly increasing demand for education, a decline in national resources available to support education, and a drop in teacher quality and preparation—the result of expanding the education system faster than qualified teachers could be recruited or trained (World Bank, 1988; Chapman and Carrier, 1990).

Improving educational quality has taken on even greater priority within the agenda of international donor agencies, largely from a recognition that education is a necessary component of sustained economic and social development. One of the most intuitively plausible and widely held beliefs underlying international educational development activities is that the most direct and efficient way to improve instructional quality is to improve the content and pedagogical expertise of teachers through increased levels of preservice and inservice training. Teachers mediate students' encounter with content; they control the classroom activities most directly related to learning. More effective teaching, it is argued, can lead to higher levels of student achievement. Consequently, teacher training is the most widely-employed strategy (by itself or with other strategies) to improve instructional quality in the Third World.

It is puzzling, then, that research on factors affecting student achievement in developing countries has found only inconsistent relationships between the teachers' own length of schooling and their students' achievement (Fuller, 1987). The reasons for these relationships are unclear. One possibility is that teachers, once trained, are unable to implement their newly learned behaviors within the school setting, the potential benefits of which are then lost on the student. This possibility has not been examined, due largely to the problems encountered in conducting in-classroom research in the Third World.

This paper reports the results of classroom observation research in Botswana which investigated the extent to which teaching behaviors differed across teachers with different levels of formal preservice teacher training. It would be expected that if increased levels of teacher training result in higher student achievement, there should be observable differences in teachers' classroom behavior in ways consistent with the literature on effective teaching. If, however, there is little or no difference in the classroom behaviors of teachers, it would raise serious questions about the efficacy of teacher training, particularly with respect to its impact

on student achievement. This finding, in turn, would help explain the larger body of research which has failed to confirm a consistent impact of teacher training on student achievement. The results of this study have important implications for the design of interventions to improve educational quality in the Third World and, secondly, may highlight an area needing attention in future evaluations of programs that target more or improved teacher training as a means of raising student achievement in developing countries.

Background

Across developing countries generally, a positive relationship usually has been observed between amount of teachers' overall education and student achievement – 12 of the 26 studies reviewed by Fuller (1987) which addressed this issue yielded a positive correlation. However, while statistically significant, the magnitude of those relationships were generally low. For example, teachers' educational attainment explained 11.6 percent of the variance in students' literature achievement in Chile (Husen, Saha, and Noonan, 1978). In a study of Thai primary school students' achievement, only one percent of the variance was explained by teachers' amount of education (Fuller and Chantavanich, 1976). Since statistical significance is sensitive to sample size and many of these studies employed large scale survey and testing procedures, magnitude of the relationship is a more meaningful indicator of the importance that should be assigned to these results. The results, then, are grounds for caution – the amount of explained variance tends to be small.

Even more perplexing are the regional variations noted by Lockheed and Komenan (1989). Of the eleven studies (of the 26 reported by Fuller, 1987) conducted in Africa, only four yielded significant positive relationships between amount of teacher training and student achievement. For reasons that are not at all clear, amount of teachers' overall education appears to have a less consistent relationship to student achievement in Africa than in other parts of Third World.

Length of postsecondary schooling or the number of teacher training courses completed appears to be more consistently related to student achievement (than amount of teachers' overall education) – 22 of 31 studied reviewed by Fuller (1987) yielded a significant positive relationship – but again, the magnitude of the relationship (where it was reported) was small. For example, in a study of Malaysian secondary students, only 7.7 percent of the variance in student achievement was explained by length of teacher training (Haron, 1977).

These results challenge the belief that investment in teacher training is necessarily a route to improved instructional quality and, presumably, student achievement. Yet, the research appears to defy common sense. Particularly in the Third World, education is teacher centered. Improving teacher skills should have a positive impact on student learning. While no definitive argument has been presented to explain the pattern of findings, eight possible hypotheses might explain these low relationships:

1. *Aggregate student performance in the Third World may be low because of the impoverished out-of-school settings in which many of the children live* (Fuller and Heyneman, 1989). Poor nutrition and health care operate to depress cognitive performance in ways that are not easily offset by alterations on teachers' classroom behavior. Moreover, family demands on children's

time – to do household chores or work in the field – while often necessary to the economic well-being of the family, reduce children's time for and attention to school related matters (Fuller, 1989; Boothroyd and Chapman, 1987). Fundamental economic changes are required before changes in teacher's level of training will have any independent effect on student performance.

2. *The quality of those going into teaching is low, particularly at the primary level.* The poor quality of those going into teaching mitigates the efforts of teacher training and results in little observable impact of preservice training in teachers' classroom behavior. Until recently in many African countries, primary teacher training was an option pursued mostly by primary school graduates who did not have adequate credentials to go on to secondary schooling. Given low salaries and unfavorable teacher assignment policies, those going into teaching were often students who lacked skills that would secure them a job in the private sector or a better paying government position. Primary teaching was an employment option of last resort. Where this occurs, the low quality of teacher entrants has two implications. Students may not have the intellectual and academic skills to do well in the training. Second, because of their weak prior preparation, preservice training has to focus on remediation, detracting from important pedagogical considerations. The net effect is similar – effective teaching strategies do not reach the classroom.

3. *The quality of preservice teacher training in many countries is low and tends not to be competency based.* The training vacillates between emphasizing stronger content knowledge and concentrating on pedagogical techniques as the key to better teaching performance. The compromise often does justice to neither. Moreover, pedagogical training is often too theoretical – emphasizing educational psychology rather than teaching skills. Such curriculum may be a colonial legacy, a product of a donor's notion of how teacher training should be conducted, or a reflection of a country's own interagency politics. For example, as a function of political rivalry, preservice primary teacher training in Liberia, until recently, never introduced trainees to the programmed instructional materials that the Ministry of Education had adopted for use in the schools (Government of Liberia, 1988; Thiagarajan, in press). Regardless of emphasis, teacher training may not prepare graduates to face the challenge of an actual classroom.

4. *Prospective teachers have little opportunities to practice the skills they are taught during preservice training, hence they never internalize the intended behaviors or become proficient in their use.* The preservice setting is too dissociated from actual school experience. Teaching strategies are discussed but not practiced or, even if practiced, are not performed under actual classroom conditions.

Low relevance of preservice training and inadequate opportunity to practice actual pedagogical skills is a common complaint of teachers worldwide. At the same time, the importance of such practice is well established. Quality of first teaching experience is a primary predictor of both teacher satisfaction and teacher retention in the United States (Chapman and Hutcheson, 1983; Chapman. 1983; Chapman and Green, 1986). The problem of inadequate preservice practice is exacerbated in many Third World settings since many schools are small and isolated, and the proportion of teachers without teacher training is high, particularly at the primary school level. Beginning teachers have little opportunity to obtain help from

other teachers or observe other teachers modeling the target behaviors. Teachers have little encouragement to try new behaviors or much positive reinforcement if they succeed.

5. *The impact of training may be "washed out" by the school experience teachers encounter.* Teacher training often concentrates on the ideal teaching setting and operates from a more progressive view of the educational process than actually operates in the school. When graduates enter teaching, they encounter a more traditional view of the teacher's role and are quickly socialized into the norm of the school.

Research in the U.S. consistently has demonstrated that students go through progressive shifts during preservice teacher training toward more open and informal views of teaching. These studies almost always show a regression in student attitudes toward more traditional viewpoints either during student teaching or during the first year of teaching (Zeichner and Tabachnick, 1981). In effect, the impact of training is "washed out" by the school experience. While this pattern is observed in both industrialized and developing countries, it would be expected that the conservative socialization process would be more pronounced in developing countries where community perceptions of teacher behavior are more narrowly conceived. There is, for example, a widespread perception among Botswana teachers that good teaching consists of lecture and student recitation (Prophet and Rowell, 1989). Fuller and Snyder (forthcoming) found that many teachers in Botswana did not use a variety of instructional strategies, preferring to rely solely on lecture and recitation instead.

6. *The low correlations between teacher training and student performance are a statistical artifact caused by a threshold effect.* The level of content expertise teachers need to teach in primary school, and even junior secondary school, is low. Once teachers master a basic set of knowledges, additional training will not have much effect on raising student achievement; knowing more content will not make much difference in student learning. For example, a teacher's knowing trigonometry will not necessarily improve third grade students' understanding of arithmetic.

7. *Poor psychometric characteristics of measuring instruments can depress correlations.* The low correlations between teacher training and student achievement may reflect measurement problems – particularly low instrument reliability, validity, and appropriateness. The problem in developing meaningful achievement tests is twofold. On one hand, national achievement tests in the Third World are of notoriously poor quality. To avoid that problem, some researchers have utilized more generalized international measures, such as the IEA tests. However, such independently developed achievement measures may have low curricular validity relative to what is being taught in a particular country.

Reasons for poor quality of locally constructed national tests include the lack of computer equipment, staff trained in psychometrics, and funds to support test revision, reprinting, and distribution of new tests. Sub-Saharan Africa has few cases of national tests being systematically revised on the basis of formal item analysis. Even where tests have reasonable psychometric properties, poor test security or political considerations may interfere with the valid measurement of student achievement. For example, one country in West Africa was nearly forced to invalidate its 1987 national secondary school leavers examination results when

massive cheating was detected. A Middle Eastern country has a formal procedure at the community level for adjusting student scores based on political considerations.

Curricular validity of student achievement tests developed in-country also may be low because a country has not specified the curriculum in sufficient detail to support test development (Chapman and Boothroyd, 1988). External tests, such as IEA, generally have received greater attention in development, but may not be well aligned to the particular curriculum being used by the teacher. To the degree that such measures do not align with what teachers are actually teaching, it may be inappropriate to expect that student achievement measured by those tests would be a reasonable expression of teachers' ability to express their training in their classroom.

8. *The low correlations between teacher training and student achievement may result from an interaction of factors (such as those described above)*. A combination of weak student preparation, low quality training, an unsupportive school environment, and poor measuring instruments (to name but a few) can have a cumulative impact far beyond that of any particular characteristic alone.

The theoretical linkage between teacher training and student performance is that training shapes teachers' classroom behavior which, in turn, affects student achievement. This theoretical position is not without controversy. There has been a continuing debate in the literature about the extent that teacher behaviors have much relationship with student achievement. Considerable research in industrialized countries fails to support a meaningful relationship; research in developing countries is mixed. Anderson (1987), in reporting results from the IEA Classroom Environment Study, argues that observed classroom activities and teacher behaviors tend to exert virtually no influence on student achievement and attitudes (p. 84) (see also Anderson and Postlethwaite, 1989). Saha (1983), reviewing school achievement studies in developing countries, concluded that modifying teacher behaviors can result in improved student achievement (see also Cohn and Rossmiller, 1987 and Vulliamy, 1987). Indeed, there is evidence that the impact of teacher behavior on student achievement is relatively greater in developing (than developed) countries (Heyneman, 1976; Saha, 1983). The present study builds from the research supporting a relationship between teacher behavior and student achievement.

From this perspective, one place to begin an inquiry into the seemingly low teacher training-student achievement relationship is to test the link between teachers' training and their classroom pedagogical behavior. If teachers who differ in their level of training differ in their pedagogical behaviors, it would suggest that the low teacher training-student achievement relationship is more likely due to student characteristics that impede learning, such as poor nutrition, than to psychometric problems in the way the issue has been investigated, or to other as yet undefined reasons. If teachers differing in training do not differ (or do not differ much) in their classroom behaviors, then serious questions can be raised about the efficacy and value of teacher training. Either way, the results hold important policy implications for how funds should be spent to raise student achievement and for the direction future research should take in investigating the problem.

THE STUDY

During June 1988, classroom observations were conducted of 212 teachers in 34 junior secondary schools (out of 54 possible schools) in Botswana (southern Africa). The observations were conducted by 12 education students at the University of Botswana. The observers employed an observation protocol which consisted of 97 measures of classroom attitudes, behaviors, and conditions. Each teacher was observed for a total of 40 minutes on up to three different occasions. Differences in the classroom activities and teacher behaviors across teachers who differed in their level of preservice preparation were analyzed using discriminant analysis. Teachers were categorized into four levels of teacher preparation: certificate (untrained) (N = 23), diploma (N = 127), first degree (bachelor's degree) (N = 34), and post graduate (N = 13). These groups were compared across classroom observations of teacher behavior on twelve variables selected as key indicators of effective teaching and which teacher training would be expected to affect (Table I.1).

Results

Means of each group on each variable are reported in Table I.l; the summary of the discriminant analysis results is reported in Table I.2. The analysis yielded two significant discriminant functions. The first function yielded a X^2 of 47.76, significant at p = .01, and explained 16 percent of the variation among groups on the predictor variables. Primary discrimination was between certificate recipients and post-graduate teachers. The variable-to-function correlations indicated that the discriminating function was defined by teachers' use of teaching aids, use of open questions (e.g., those allowing multiple answers), teacher preparation, and logical presentation of materials.

The second function yielded a X^2 of 18.22, significant at the p = .02 level, and explained an additional seven percent of the variance. Primary discrimination was between certificate (untrained) and diploma (teacher training only) teachers. The function was defined primarily by teacher preparation, teachers' logical presentation of material during the lesson, and the teachers emphasis on discipline. Untrained teachers appeared to have done less preparation for the class sessions being observed; diploma teachers appeared to give a more logical class presentation and tended to emphasize student development over control in their use of discipline.

Table I.1

Means for Variables Used in Discriminant Function Analysis

	Group 1 [post graduate]	Group 2 [first degree]	Group 3 [diploma]	Group 4 [certificate]	Total
Number in Group	13	34	125	23	195
Discipline emphasis: control or student development	5.90	5.96	5.68	4.76	5.64
Teacher preparation	8.08	8.13	7.60	7.93	7.77
Logical presentation	7.45	7.41	7.11	6.86	7.16
Use of teaching aids	3.90	1.60	1.11	.72	1.34
Use of open instructional questions	.68	1.30	1.61	1.90	1.53
Focus, direction, and goal orientation	7.12	7.09	7.70	6.46	6.76
Use of feedback	5.19	5.00	4.42	4.19	4.55
Use of discussion	.72	.76	.77	.70	.75
Use of small group discussion	.36	.53	.23	.28	.30
Teacher elaboration and use of examples	7.25	7.33	6.90	6.76	6.98
Class organization	7.45	7.41	7.11	6.86	7.16
Number of instructional questions	3.31	3.29	3.32	3.43	3.33

Table I.2

Summary of Discriminant Function Analysis

	Standardized Disc. Funct. Coeff		Item-to-Funct. Correlations	
	Function One	Function Two	Function One	Function Two
Discipline emphasis: control or student development	.16	.71	.26	.36
Teacher preparation	-.26	-1.14	.21	-.51
Logical presentation	.44	.69	.48	-.12
Use of teaching aids	.78	-.27	.85	-.29
Use of open instructional questions	-.35	.11	-.41	.04
Focus, direction and goal orientation			.43	.05
Use of feedback			.19	-.10
Use of discussion			-.16	.10
Use of small group discussion			.12	-.12
Teacher elaboration and use of examples			.16	-.05
Class organization			.21	-.30
Number of instructional questions			.08	.08
Group Centroids				
Group 1 (post graduate)	1.28	-0.36		
Group 2 (first degree)	0.24	-0.31		
Group 3 (diploma)	-0.09	0.17		
Group 4 (certificate)	-0.59	-0.63		
Eigenvalue	.169	.077		
% of variance explained	62.98	28.66		
Cum % of variance	62.98	91.63		

Table 3

Botswana Teacher Salaries By Level of Training
(1989 data, reported in Pula)

Level of Training	Government Salary
Cambridge graduate	P 4,464
Diploma in Primary Education	P 9,912
Diploma in Secondary Education	P 10,212
Bachelors Degree (untrained teacher)	P 10,836
Bachelors plus CCE (concurrent)	P 12,564
BSc plus PGDE	P 12,936

Source: Botswana Ministry of Education

DISCUSSION

Overall, the results indicated that there were statistically significant and meaningful differences in observed classroom behavior of teachers who differed in the amount of teacher training they had received, with the greatest differences between those who had received no training and those at the post graduate level. Significant differences were also observed between teachers with no training and those with a diploma from a teacher training institute – the most common credential within the teaching force. The magnitude of the differences across both functions together accounted for 25.5% of the variance in the predictor variables.

Unfortunately, previous research in this area is too scant to support a clear expectation of how large a relationship should be expected between teacher training and classroom performance as a basis for judging the importance of this finding. Teachers' classroom behavior, however, is shaped by teacher background and experience, characteristics of the students and their families, students' behavior toward the teacher, community norms and values, and by the nature of the content being taught. Many of these factors are more salient to the immediate classroom setting than the preservice training a teacher once received. Further, the reviews of process-product research in the Third World suggest that the magnitudes of most relationships between material inputs and student achievement are low, generally less than ten percent (see, for example, Fuller, 1987; Saha, 1983). It might be expected that the relationship between material inputs and process variables would be in the same general range. The ability, then, to account for 25% of the variance in teachers' classroom behavior in terms of amount of preservice training is impressive. These results suggest that preservice teacher training can modify teaching behaviors, at least in Botswana.

An examination of the specific dimensions of classroom behavior that differed across levels of training, however, raise perplexing questions about the direction those modifications have taken. Post graduate teachers presented content more logically and made better use of teaching aids than did uncertified teachers, while uncertified teachers made more use of open instructional questions. The more logical content presentation by post graduate teachers is an expected outcome of having up to five years more education. Presumably, postgraduate teachers knew their content better and had a better conceptual scaffold for organizing the content of their lessons. The use of teaching aids, on the other hand, is probably a more direct outgrowth of the emphasis on pedagogical techniques within teacher training. However, the difference in the use of teaching aids among teacher groups was small. An examination of the mean scores for each group on this item (Table I.1) reveals that untrained teachers made virtually no use of teaching aids, and even post graduate teachers were rated relatively low in their use. The tendency of teachers with more training to make less use of open questions is surprising, since that technique is often considered to be an effective pedagogical strategy to encourage higher order cognitive processing by students and is a pedagogical strategy typically emphasized in teacher training programs.

While differences between the least and most trained teachers offer a perspective on the overall efficacy of teacher training, the second function – which discriminated primarily between teachers with no training and those with only teacher training – offers a more troublesome finding. Untrained teachers appeared to have given more attention to their lesson

preparation, though they were less logical in their actual presentation of the material. Secondly, untrained teachers exhibited somewhat more of a student development (as opposed to a control) orientation in their use of discipline in the classroom. Their greater attention to lesson preparation and student development (within the context of classroom discipline) are behaviors that teacher trainers seek to impart. In this study, teachers with training appeared to exhibit those behaviors less than teachers without formal training. Though the magnitude of the differences was small, it runs counter to expectations and raises questions about the effectiveness of teacher training.

One possible reason for the differences in lesson preparation is that, for untrained teachers, their teaching job is more important to them, they see it as upward career mobility, and they are working above their level of qualification. Untrained teachers may work harder at lesson preparation to compensate for their lack of training or low subject matter competence. Teachers with formal training may feel more secure in their job, more sure of their skills, more inclined to assume they know the material, and less likely to prepare. Having formal training and the greater job security that it brings may engender a level of self-confidence which, warranted or not, may lessen teachers' motivation to do a through job. Over time, teachers with the most training are the ones least likely to be prepared and the most likely to maintain a teacher centered classroom.

A possible explanation for the larger pattern of differences is that training provides teachers with skills they need to deal with the complex tasks of the classroom (the complexity reduction hypothesis). Teachers with more training attempt to more tightly organize their classes because that decreases the complexity of their job (Snyder, 1990). Their training enables them to exercise better control, but that may come at the cost of deemphasizing open questions and some aspects of student development. Thus, teacher training is valuable, in a sense, but has problematic aspects. It provides teachers with skills they can use to structure their work environment, but they sometimes structure it to serve their own worklife needs rather than to maximize the use of effective pedagogical strategy that might better enhance student learning. There is a tension, then, between the pedagogical activities that most foster student learning and those behaviors which reduce the complexity, and therefore enhance the quality, of teachers' worklife.

Low quality of worklife impedes the quality of teachers' performance, reduces teachers' openness to innovation, and increases teacher attrition. (See Snyder, 1990). Improved quality of worklife is widely thought to be a worthy goal in-and-of itself. However, improving the quality of teacher worklife will not necessarily positively affect the achievement of students. More troublesome, however, is that results of this study suggest that teachers' efforts to improve the quality of their worklife may have an unexpected indirect negative effect on the effect of classroom strategies. In their efforts to reduce the complexity of their classroom environment, teachers may inhibit behaviors that encourage higher levels of cognitive processing (and higher achievement) among students.

Of considerable curiosity is that the groups tended to score low and **not** to differ much on items describing teacher-student interaction – use of feedback, class discussion, small discussion groups, overall use of questions. These pedagogical behaviors are at the heart of what

many teacher training advocates argue should improve student achievement, though heavily at odds with conventional teaching practices in much of Sub-Saharan Africa. This finding [e.g., of little positive teacher-student interaction] is consistent with Prophet and Rowell's (1990) observations that Botswana classrooms are highly teacher centered, allowing little meaningful teacher-student exchange or collaborative inquiry into the things being learned.

These results suggest that preservice teacher training may be an effective point of intervention if the goal is to shape teachers' classroom behavior (even if present practices do not necessarily lead to the particular behaviors desired). Indeed, if anything, the amount of variance explained in this study was probably a conservative estimate of the actual relationship between Botswana junior secondary teachers' training and their subsequent classroom behavior. Observational studies of teacher behavior suggest that there is often as much or more variance in a teacher's behavior across occasions as there is variance in teaching behaviors across different teachers (Anderson and Postlethwaite, 1989). This within-teacher variance works against the likelihood of finding significant differences between teachers differing in amounts of training. Secondly, the sample of certificate level teachers in this study had constrained variance. There is a relatively high turnover of untrained teachers in Botswana schools and an increasing pressure from the government against refilling empty positions with untrained personnel. For untrained teachers to persist in teaching often means that they have "learned" from their colleagues or from their own experience and are regarded by other teachers and parents as effective. Hence, those untrained teachers still in the system tend to be the survivors, the best of those who entered teaching without formal training. If this study was conducted with a full range of those who entered teaching without training, differences in classroom behavior (compared to trained teachers) would be expected to be greater. Consequently, if anything, the present study probably underestimates the relationship that actually exists between teacher training and classroom behavior.

Interpretations of these findings depends, in large part, on how one interprets previous research on the teacher behavior-student achievement link. If, as some authors argue, teacher behavior has little or no impact on student achievement, the present results represent a positive finding. Teacher training is related to a higher quality of teacher worklife, presumably at no cost to student achievement. If, however, teacher behavior does influence student achievement, the present results lead to a less positive conclusion. Teachers' actions to improve the quality of their worklife may be at odds with actions that would enhance student achievement. As stated earlier, the weight of the evidence on the relationship of teacher behavior to student achievement in the Third World suggests there is a meaningful relationship (Saha, 1983; Cohn and Rossmiller, 1987). The implication, then, is that training may need to be modified in ways that are more likely to result in teaching behavior that enhances student achievement.

While training was related to teacher behavior, the practical value of the present results must be examined in terms of cost relative to benefit. Teacher training is expensive. While the amount of explained variance may be impressive within the context of previous research, it is still modest in terms of actual teacher behavior. Is the amount and pattern of change observed in teachers' classroom behavior worth the cost?

The unit cost of teacher education in Botswana in 1983/84 was estimated at 938 Pula per year ($1 = approximately P 2). By 1984/85 that unit cost had jumped to 1,455 Pula and has continued to rise (Government of Botswana, 1986). Cost to government of moving a person from unqualified to the first level of qualification for junior secondary teaching (teacher training only)—three years of training—was about P 4,365 in 1984. But the truly enormous cost of training comes later. Trained teachers command higher salaries. In 1989, Botswana junior secondary school teachers with only a Cambridge certificate earn P 4,464 annually; postgraduate teachers receive P 12,936 per year. As teachers are trained, the recurrent cost of education escalates dramatically.

Most governments believe it a worthy investment if the training results in higher quality education in the schools which, in turn, contributes to needed economic and social development of the country. Therein is the issue. Results of this study found 25.5 percent of the variation in classroom teaching behavior was associated with teachers' level of training, an impressive but still moderate amount, especially in light of the generally low relationship between teacher behavior and subsequent student achievement. Moreover, some of the differences associated with more training seem counter-productive to encouraging student achievement. These results do more to encourage optimism for the potential of teacher training to positively impact student achievement than to invite satisfaction with current practice. Whether teacher training is judged to be a cost-effective intervention depends on whether more effective or less expensive alternatives (to raise student achievement) are available and, at the same time, on the cost and effectiveness of modifying teacher training in ways that encourage behaviors more conducive to student achievement.

From an immediate policy perspective, preservice teacher training, as it is currently conceived, appears not to be a particularly efficient means of raising student achievement (the amount of variance explained is only modest, the linkage to achievement is indirect). To the extent that student achievement is the goal, available funds might be better spent in some other intervention—for example, short-term, focused, in-service training. Nonetheless, given the educational and political popularity of preservice teacher training in many countries, it remains a highly credible intervention. It may be useful to capitalize on that credibility by "fixing" preservice training and continuing to emphasize it as a major educational improvement strategy. Fixing it requires that ways be identified in which it can be modified to have greater impact in shaping pedagogical behavior thought to be more directly related to student achievement. This will require further understanding of the dynamics that operate as aspiring teachers are recruited, trained, and eventually enter the schools. It also will require that attention be given to identifying alternative ways that teachers can either reduce or better cope with classroom complexity as a means of improving the quality of their worklife.

Results of this study must be interpreted within the context of Botswana, though the implications go well beyond. In the last three years, Botswana has made meaningful gains in improving both its junior secondary curriculum and preservice preparation of junior secondary teachers. However, the product of these efforts is only now beginning to reach the school level. Hence, the results of this study do not necessarily describe the skill level of recent graduates of Botswana's preservice teacher education program. The extent to which these results apply to more recent graduates remains to be seen. In the meantime, the results highlight an

important area for continuing investigation for international educational development strategists.

Summary

This study was initiated as a search for reasons why the relationship between teacher training and student achievement, particularly in Africa, tends to be low. One possibility is that the mechanisms by which teacher training operates on student achievement may be less powerful than teacher training advocates and international development specialists have believed. Much of teacher training is built around instilling in the would-be teacher a set of target pedagogical behaviors judged to have a positive effect on student achievement. This study investigated that training-behavior link among junior secondary school teachers in Botswana.

Results of this study indicated that, at least in Botswana, teachers differing in level of training did differ significantly in their in classroom teaching behaviors, though not necessarily in ways that would raise student achievement. The analysis explained an impressive amount of the variation in teachers' classroom behavior, but 75 percent still remained to be explained by other factors. The compound effect of only a moderate relationship between teacher training and teacher behavior, the tendency for the more highly trained teachers to exhibit behaviors that favor quality of worklife over student achievement, and the already-recognized-to-be-low relationship of classroom behaviors on subsequent student achievement may be part of the reason why teacher training appears to have little relationship to student achievement in Africa. At the same time, results are a basis for optimism that, with work, teacher training can operate as a more meaningful force to improve educational quality in developing country contexts.

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II. Classroom Affect and Complexity: Ecological Perspective of Botswana Junior Secondary Schools

David W. Chapman, State University of New York at Albany
Conrad W. Snyder, Jr., Florida State University
Bruce Fuller, Harvard University

Classroom Affect and Complexity: Ecological Perspective of Botswana Junior Secondary Schools

Conrad Wesley Snyder, Jr.
Florida State University

David Chapman
State University of New York at Albany

Bruce Fuller
Harvard University

. . . variety in unity being the secret of all interesting talk and thought . . .
William James

We know that children have an immense capacity for activity, extensive enthusiasm, and wide-ranging curiosity. When subjected to school attendance, however, these dynamic attributes frequently appear stifled rather than developed and misdirected rather than focused on productive enterprises. Many education systems are said to be relatively benign in comparison with other influences (cf. Coleman, et al., 1966; Jencks, et al., 1972) and others have serious problems with the quality of their programs (cf. Fuller and Heyneman, 1989). In order to come up with some better ideas and answers to build on the natural inquisitiveness of our youth, a great deal of research is now focused on school effectiveness around the world.

Botswana, the 24-year old republic in southern Africa, has a relatively new basic education school system. The system has grown from sparse school coverage of the nation's young population to nearly universal primary education with plans for expanded access through nine years of schooling. Accordingly, the number of junior secondary schools has increased from 9 at independence in 1966, to 23 in 1983, and 99 in 1989, eventually intended to reach about 180 schools by the mid-1990s. In the midst of expansion, many changes are tolerated, all as part of a general adjustment to new facilities, conditions, personnel, and curricula. But, as schools become established and the larger system stabilizes, the possibility for creative intervention and innovation will decrease and pockets of resistance to new ideas may crystallize (cf. Snyder, 1990; Snyder and Fuller, 1990). The question is what can we learn from this embryonic and evolving educational program that will provide useful reflections for Botswana, hints for intervention in other developing contexts, and perhaps ideas for established systems that are more opaque to research insights.

Spectrum of Affect

Eisner (1985) pointed out that teaching can be characterized as aesthetic. In some cases, the classroom flows with activity in a well-orchestrated cohesiveness that is experienced as mutually satisfying to student and teacher. The teacher calls on an extensive repertoire of teaching routines that effortlessly and seamlessly create a stimulating and enriching environment. In other cases, of course, a dull instructional routine produces a monotonous classroom tone that encourages blank stares and wandering imaginations. After visiting a number of schools and their classrooms, it seems quite reasonable that school quality can be felt, that is, perceived from the affect immediately experienced in the constituent classrooms. Undeniably, students and teachers feel the same qualities as they engage the learning process. The affect associated with the classroom may reflect the adequacy of the learning context and accordingly, the success or failure of the educational effort.

There are good theoretical reasons why affect is an important feature of a school. Affect and cognition are considered two aspects of the same process, that is, assimilating the environment as structured by the teacher or fellow students:

> Affective life and cognitive life are inseparable because all interaction with the environment involves both a structuring and a valuation, but they are nonetheless distinct, since these two aspects of behavior cannot be reduced to one another. Thus we could not reason, even in pure mathematics, without experiencing certain feelings, and conversely, no affect can exist without a minimum of understanding or discrimination. (Piaget, 1950, pp. 5-6)

Through affect, we may identify a new complex of qualities that contribute to effective education. In historical terms, the study of affect marks the beginning of the study of experimental psychology. Gustav T. Fechner published his *Elemente der Psychophysik* (Elements of Psychophysics) in 1860, laying a methodological foundation for the exploration of links between the mental and physical worlds of humanity (representing the lingering influence of Plato-Descartes mind-body dualism that has dominated psychology in various forms for over a century). Not long after, Wilhelm Wundt (e.g., Wundt, 1874) presented a set of important introspective theories on the role of feelings in sensation and perception. One of the more important and enduring notions is expressed in terms of the 'preference function' illustrated in Figure II.1. According to this view, low levels of stimulus intensity are experienced with indifference, moderate levels with maximum pleasantness (the highest single peak), and high levels with unpleasantness. Later experimental work provided credence to 'the Wundt curve.' In subsequent research, Fechner provided the impetus to look for stimulus characteristics that influence affect judgments of preference and pleasure, and Wundt suggested a specific theoretical framework for the consideration of stimulus-affect relationships.

For many years researchers sought to explicate the relationships between structural aspects of stimuli with affective reactions. One of the more notable research programs was that of Daniel Berlyne and his colleagues (1971, 1974; Day, 1981; Walker, 1980). Berlyne, following Fechner, was convinced that the properties of stimuli determined, in turn, motivational and

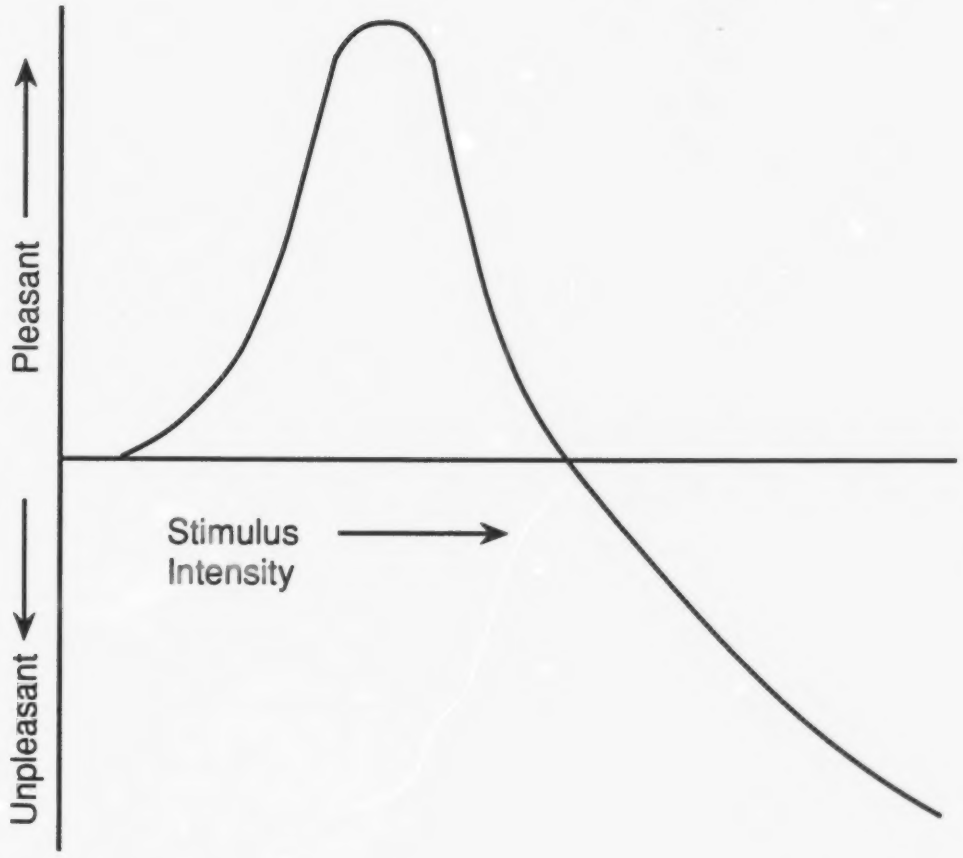

Figure II.1: The Wundt curve, representing a hypothetical relationship between perceptions of pleasantness and unpleasantness, and stimulus intensity.

hedonic effects. The structural aspects of the stimuli induce arousal through perceptual conflict, which then leads to **some** related hedonic tone. Conflict involves the perceptual comparison (collation) of the structural elements of the stimulus (or stimuli) and results from the degree of dissimilarity or discrepancy between the elements, a potentially aversive state that the individual seeks to escape, resolve, or avoid, and in this sense is 'motivated.' Edward Walker (1980) pointed out that the complexities of Berlyne's hypotheses were unnecessary because arousal was primarily influenced by the prior structural conditions. He proposed a more parsimonious "Hedgehog Theory of Behavior" that recast Wundt's curve in terms of Complexity (stimulus structure) rather than Intensity (which is conceptually independent of the structural quality of the stimulus).

> The reference to the hedgehog comes from classical comparisons of the behavior of hedgehogs and foxes. The fox is a clever animal with more solutions than he has problems. The hedgehog has survived for many thousands of years with a single trick. Whatever happens, the hedgehog curls up into a ball. Psychological Complexity and Preference Theory is a simple theory that is applicable in all situations.
>
> There are two basic postulates of theory: (1) There is an optimal level of psychological complexity for a psychological event that will be preferred to either simpler or more complex events; (2) Repeated experience of an event will lead to progressive simplification of that event. The first is the preference postulate and the second is the learning postulate. (Walker, 1981, p. 40).

In the quest for the 'inverted U,' three primary response dimensions have garnered most of the attention: Complexity, Interestingness, and Pleasantness, the first constituting the structural baseline and the last two comprising the affective attractiveness of the stimulus. Simplistically summarizing the research in this area, Complexity and Pleasantness emerged as clear dimensions, but Interestingness associated linearly with either Complexity or Pleasantness rather than consistently associating only with the evaluative dimension. Eckblad (1980,1981a, 1981b) hypothesized that these affective relationships are explained in terms of a single underlying (hypothetical, and more fox-like) construct, *Assimilation Resistance*. At low levels of resistance, the affective response is specified as boredom, rising to pleasure, then interest, irritation, and confusion as the level of assimilation resistance gets higher. Each of these affective ratings, plotted as a function of objective informational complexity, is a 'Wundt-like' inverted-U curve with their highest points ordered along the scale of assimilation resistance. These 'mountains' of affect are more differentiated the greater the range of resistance the informational context presents to the individual's available sensorimotor and conceptual schemes. So, if the stimulus complex is familiar and easily assimilated, then the individual may be bored by the encounter. If the information presents some challenge, but is mastered without difficulty, then the individual may have a pleasant experience. And, if too much complexity is present, then unpleasant affect is reported.

For educational contexts, interestingness is the key affective response. It has been linked to curiosity, exploration, attentiveness; it reflects the so-called 'moving edge of assimilation,' where mastery is not immediate but is promised by further accommodation of schemes to the context. The goal for education is to keep instructional materials and activities in this interest-

ing range, so that they challenge the intellectual capacity of students but can be assimilated and mastered. Complexity must be added to maintain continuing interest in the instruction in order to build the repertoire of talents and schemata for academic attainment. The aim is to keep interest as closely related to complexity as possible. By this rendition, then, education becomes primarily the management of assimilation resistance.

These classical models of human affect attribute the cause of affect to the collative/informational properties of the external stimulus and the effect, the affective response, to feelings or cognitive appraisals within the individual. Information is here identified with input to an information processor, the person. Unfortunately. the input-cognitive model frequently collapses to the regress of homonculus control (i.e., a person 'within' is required by the model to implicitly direct the higher cognitive processes). Eckblad (1981b, pp. 110-111) recognizes this common flaw:

> "Generally speaking, present models of human cognition and information processing appear to suffer from the fact that the phenomena of purpose, control, motivation, and so on have not been conceptually integrated with the information handling process itself....[T]he account of the cognitive processes itself may be incomplete as long as the mechanism of central control is not treated in the same framework and to the same depth as the more subordinate information handling processes. One will only be able to account for **subsystems**, separate mechanisms for this function or that. The account may be doomed to be incomplete. In actual life, the processes of memory, perception, and problem solving always function in a context of purposive activity, shaped by higher order motives and goals. In view of the strong context effects which may be found in psychological processes, it is probable that the subprocesses of information handling cannot be described properly without taking account of the context in which they function."

One way out of this dualistic (mind-matter) corner is to adopt a direct-realist point of view, as developed by J.J. Gibson (1966, 1979) in perception research. The paradigmatic objects of perception are not patterns or collative properties of stimulation that require processing, but rather immediately detected environmental (ecological) events and their **affordances**, which inform the possibilities for interaction. The affordances (that is, what the environment affords for action) structure the information or energy patterns in the environment:

> "Control lies in the animal-environment system. Control is by the animal in its world, the animal itself having sub-systems for perceiving the environment and concurrently getting about it and manipulating it." (Gibson, 1966, p. 225).

This view is similar to Eckblad's scheme theory, but we drop the computer analogy and propose an ecological unit rather than the scheme 'program' (and also, we drop the lens structure analogy for the functions of the hierarchic system of schemes, in the sense of Brunswik, 1952). Assimilation resistance, as developed by Eckblad, refers both to the structure of the environment as well as the capacity of the individual. We can associate it with the reciprocity of the individual and environment, that is the individual's perception of the affordances offered by the ecological context, rather than a state of 'internal' cognition. The theoretical ramifications would be handled under perceptual learning rather than cognitive processing. Affect is not depicted here as something that emerges from within the individual

as an outcome of undifferentiated feelings, but lies in the (meaning of the) ecological unit (in the organism-environment reciprocity). As Gibson (1966, pp. 100-101) indicated in another context:

> "The remarkable fact is that when a man touches something with a stick he **feels** it at the end of the stick not in the hand. This is a difficulty for the theory of sensation-based perception: it requires some such postulate as the projecting of sensations outward from the body. But we entertain the hypothesis that information for the mechanical disturbance at the end of the stick is obtained by the hand as a perceptual organ, including information about the length and direction of the stick. The sensations in the hand are irrelevant."

In the same sense, the internal 'feelings' and arousal often ascribed to affect appear to be irrelevant or epiphenomenal (Eckblad, 1981b). Affect constitutes the simultaneous valuation or hedonic meaning associated with the particular environment experienced through the activities of the individual. The language of affect verbalizes the detection of affordances in the encounter: worthy of further exploration and interest, likely to be mastered and pleasant, too easy or boring and not worth the attention, and confusing and not likely to be mastered. Walker (1980) has demonstrated that affect-words can be related in consistent ways without reference to context or stimuli, but this is exactly what we would expect from an ecological viewpoint – the meaning of words is found in their use (Wittgenstein, 1953) and it evolves from a public forum. Affect language is inextricably linked to context and the individuals associated with it. In a particular situation, the range of words may be restricted to the affordances that are perceived. Education, in fact, illuminates other affordances, making possible new intellectual and behavioral links within the ecology.

Perception is an act, not an outcome of stimulation, so that affect, which accompanies it, reflects the active perusal of environmental possibilities. Affecting and perceiving are different ways of describing the same process. When we observe a classroom, we don't take a snapshot of 'affect'; we experience the "flow" of activities and their concomitant affects. Flow refers to the efficiency of actions involving the actors, the smoothness of experiences each coordinated and rhythmically connected, the merging of action and awareness with the center of attention absorbed on the activities, and the continuity of activities punctuated by rewarding challenges of which the actors remain in control (Csikszentmihalyi, 1975). It's the degree of interaction or involvement of the actors with their activities.

Interestingly, the notion of flow was found to be important in Gibson's work on mobility and vision as well. Because we are purposive and active, it is very difficult to account for the 'success' of our movements in terms of a linear-causal, stimulus-response processing model.

> "No fact of behavior...betrays the weakness of the old concept of visual stimuli so much as the achieving of contact without collision – for example, the fact that a bee can land on a flower without blundering into it. The reason can only be that centrifugal flow of the structure of the bee's optic array specifies locomotion and controls the flow of locomotor responses." (Gibson, 1982, in Reed and Jones, p. 14)

It is the information in the optical flow field that is available to our visual system that enables us to orient the movement of our bodies as a whole to the environment and interact with more aspects of it. Different kinds of information within the activity flow of the immediate ecology may be crucial for the emergence of affective qualities. With a better understanding of the notion of flow we may find an analogous affective flow field, which has a social as well as seemingly subjective reality.

Now we can return to the opening assertion that affect valuations can accurately reflect the qualities of academic environments. Since affect relates to the reciprocity of the individual-environment, or in this case, student-teacher-school, interactions, these perceptible hedonic valuations of the ecological affordances should be very good indicators of classroom and school qualities. Affect may be the way to get at the 'real' educational environment of a school, where tests open only narrow windows to the effectiveness of the academic process. Classrooms that flow are qualitatively different from those marked by wide variations in affect.

The Botswana Junior Secondary School

In order to explore the proposition that the affective qualities of schools can be detected by neutral observers, a study of 603 Botswana classrooms of 212 teachers at the junior secondary level was undertaken. Teachers were observed up to three times (see Fuller and Snyder, in press, for descriptive and reliability information), and their classrooms were rated for affect, behavior, and conditions (the ABCs) by 10 trained Batswana university research students. Local observers were used because they could follow all interactions regardless of language or cultural expression and they were naturally experienced observers of Botswana classrooms by way of their own successful progression through the system to their highly selective university status.

The junior secondary schools in Botswana constitute the eighth and ninth years of education. At the end of the program, a set of exams, based on junior secondary syllabi, is taken to determine who goes on to senior secondary school (between 40-50% find places at present). The observations were completed at 32 schools (out of 87, 75 of which had students eligible for the junior certificate examinations) in the middle of the school year at both levels of education. Junior certificate (JC) examinations were completed at the end of the year, so that overall school results were available for the analysis (see Bowers and Moahi, 1989, for the calculation of the first principal component scores of the core Botswana JC tests; see Table II.1 for the subject intercorrelation matrix).

With respect to this study, eight (traditional) affect and structural scales were rated: complexity of the instructional approach, lesson difficulty for students, student uncertainty about lesson concepts, teacher satisfaction, student satisfaction, student interest, teacher enthusiasm, and student attentiveness to instruction. Raters completed the assessments immediately following a 40-minute class session. The ratings ran from 0 to 10, with means and standard deviations given in Table II.2.

Table II.1

Intercorrelations of School Raw Score Averages
on the Junior Certificate Subject Examinations

Junior Secondary Subject	Mean	S.D.	Set	Eng	Mat	Sci	Soc
Setswana	77.1	5.8					
English	82.1	5.7	.33				
Mathematics	57.0	6.9	.24	.36			
Science	70.8	6.1	.44	.45	.51		
Social Studies	82.4	7.2	.31	.44	.33	.45	
Agriculture	118.0	9.0	.40	.34	.33	.47	.29

Table II.2

Means and Standard Deviations of the Affect and Complexity
Variables for the 603 Classroom Observations

Variable	Mean	S.D.
Complexity of instructional approach	1.34	1.48
Lesson difficulty for students	2.25	1.69
Student uncertainty about lesson concepts	2.39	1.64
Teacher satisfaction	6.62	1.30
Student satisfaction	6.04	1.35
Student interest	6.11	1.52
Teacher enthusiasm	6.50	1.47
Student attentiveness	6.66	1.27

Based on Eckblad's work in problem solving, Interest and Uncertainty were expected to be the best indicators of academic attainment. In this case, however, the data were aggregated to school level (which is an isolated, loosely-coupled, social unit within the education system) to explore the grander claim that affect and attainment will be related, even at this macro tier of analysis. The multiple Rs were 0.62 ($p < .01$; 38% of the variance in the JC results) for student interest and uncertainty and 0.49 ($p < .05$; 24% of the variance) for teacher enthusiasm and instructional complexity (or 42% of the variance, if both student and teacher information is used). These are substantial correlations for school mean data. The equations (27 of the 32 schools observed took the JC in this year) are, in standardized form,

Std School JC Score = 0.31 Interest – 0.50 Uncertainty, and

Std School JC Score = 0.49 Enthusiasm – 0.02 Complexity, and, in unstandardized form,

School JC Score = 0.33 Interest – 0.69 Uncertainty – 0.30, and

School JC Score = 0.56 Enthusiasm – 0.02 Complexity – 3.55.

Of course, the correlations between affect and academic performance are not necessarily causal relations. The associations merely attest that six months before a national examination, neutral classroom observers, with reference only to rating scales of interest and complexity, can predict school results fairly well. We cannot be sure what ecological information was used by the raters to assess interest and complexity, but certainly their common understandings appear to indicate that academic quality is related to non-academic (non-test) affect variables.

Since selection procedures are regional (with close to 600 feeder primary schools across the country), the variation in school means of these variables should not be due, at least substantially, to related biases in the types or abilities of students assigned to the various schools (although location of home is considered in school assignment). Teacher enthusiasm and student interest are by intent contextual variables. In fact, we shall argue throughout that while social, tribal, and other biases should be minimized through appropriate selection procedures, advantages would accrue if individual differences in learner characteristics were recognized (at least within schools) to allow teaching strategies and content difficulty to be better geared to particular student capacities, thus manipulating complexity and interest. As pointed out by Cronbach and Snow (1981, p. 2),

> "What is done for the 'fast' and 'slow' groups has to be the focus of attention. Grouping will have negligible consequences for learning unless the treatment is redesigned to fit each kind of student. Streaming plans intended merely to simplify the teacher's task are properly condemned as perpetuating social stratification. Stratification in school is even more objectionable when the plans force different "kinds" of educational goals upon students with different abilities. For most purposes the school needs a plan that directs all learners in the same intellectual and developmental directions, but using procedures designed to fit each one's characteristics. Such a plan could hope to 'reduce' social stratification."

Some schools project a cohesive affective ecology in which the 'school spirit' resonates throughout the classrooms. The nature of the school can be detected in any of its activities.

However, there are others that hardly seem like interacting communities. There is little unity or cohesiveness in the school. In this sample, the greater the variation of interest or enthusiasm (across classrooms), the lower the subsequent JC attainment for the school candidates (16% and 11% of the variance respectively). Further perusal of the data indicated that the source of variation may be between subject areas. High variation in teacher enthusiasm was noted particularly for Setswana (the language of the Tswana), and high variation in student interest for Setswana, Religious Education, and Agriculture (subjects that are not yet well organized, which suggests immediate and worthy intervention opportunities). These affective variations may represent disruptions in the overall flow of school affect and loss of involvement in related achievement pursuits, ultimately contributing to poorer examination performances. Schools that present consistent affect patterns provide a common learning environment; schools that present a consistently interesting pattern of coursework may be somehow more successful in adjusting their academic programs to meet the range of learner characteristics faced in their classrooms. Interesting classrooms suggest the active involvement of students in learning endeavors.

Relationships Between Affect and Complexity

Relationships between affect and structural variables are conveniently illustrated in a two-dimensional component space, in which the horizontal axis carries the maximum variance configuration for the variables and the vertical the next highest set of relations. Traditional results have found Pleasantness and Complexity to be spread apart (not independent, but non-linearly related, which can result in a small linear contribution) and Interest to fall between. Table II.3 presents the intercorrelations (Bartlett test yielded significance for the matrix) across the teachers and the calculated component weights, and Figure II.2 portrays the relationships.

Table II.3

Intercorrelations and Component Weights for the Affect and Complexity Variables Across the 212 Teachers

Variables	CPL	DIF	UNC	TSA	SSA	INT	ENT	Components I	Components II
Complexity								-.49	.67
Difficulty	.56							-.72	.54
Uncertainty	.56	.85						-.76	.50
Teacher Satisfaction	-.37	-.39	-.45					.79	.09
Student Satisfaction	-.28	-.46	-.54	.78				.87	.18
Interest	-.04	-.30	-.33	.50	.69			.72	.48
Enthusiasm	-.09	-.20	-.27	.48	.51	.46		.61	.40
Attentiveness	-.07	-.29	-.29	.39	.49	.67	.44	.65	.44
							Variance Accounted for =	50.3%	20.1%

Bartlett Chi-Square Statistic = $p < .01$

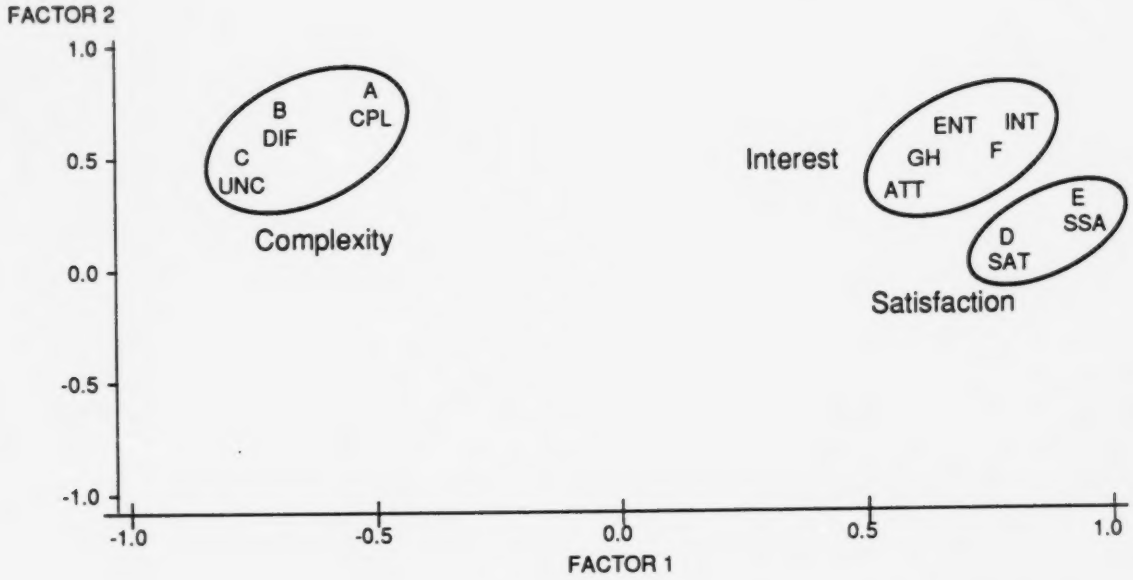

Figure II.2: Component space for affect and complexity variables.

The arrangement of variables in the component space conforms to the Complexity, Interest, Pleasantness order expected and accounts for 70% of the total variance, but has some noteworthy features. First, it appears that student affect and structural variables are closely related to those for the teacher. To the extent that the observer has relied upon different information, this result mirrors the mutuality of the teacher-student classroom ecology. For example, student interest and attentiveness may promote teacher enthusiasm, be caused by the enthusiasm, or be the result of a reciprocal interplay of affect flows (our choice). Undoubtedly, we need more texture to this result; other studies (e.g., Soar, 1977; Soar and Soar, 1979) have reported that student and teacher affect are not necessarily linked. The difference may arise from the fine grain analyses of these prior studies rather than the present holistic focus on the mutuality of events across the class period. Some individual variations may appear personally significant to the individual, but not disruptive of the classroom flow.

Second, the angle between the set of Complexity variables and the sets of Interest and Satisfaction variables is large. In Eckblad's terms, this results from high assimilation resistance; that is, a large number of teachers fall beyond the boundaries of Interesting, between Interest and Complexity, and are part of classrooms in which students would have difficulties in assimilating the instructional information. While this account may have some validity, there's also something else going on in the ratings that is curious. The means for the Complexity variables are low, with large standard deviations, indicating very skewed distributions. Despite the potentially large inherent complexities of a classroom, the observers noted none or little in most cases. In work on contrived or limited-set stimuli, Complexity emerges as the dominant variable set on the dimension accounting for maximum variance (e.g., Eckblad, 1980, 1981a; Kroonenberg and Snyder, 1989; Snyder, 1988; but see Snyder, Walsh, and Pamment, 1981). What little variation in Complexity is perceived in observing these classrooms, it is seen as relatively negative with respect both to Interest and Satisfaction. Our guess is that when it comes to 'real-life' interactions with dynamic 'stimuli,' like classrooms, Psychological Complexity (contrasted with the countable elements and intricacies of experimental stimuli) is less a structural variable and more an indicator of flow changes and discontinuities. It becomes evaluative. We may be able to change this by issuing different instructions to the observers, but the evaluative use of Complexity in a dynamic ecology probably reflects more accurately the way we use the word to describe perceived breaks or diminishing action patterns by students and teachers. Perceived complexity, which distracts from harmony, is negative.

Also, the large Complex-Satisfaction angle suggests potential difficulties in the introduction of new instructional methods. Unless methods are introduced 'smoothly,' with skill and naturalness, they will alter the ecological niches available for and expected by students. First, there may be some disruption due to changes in expectations, that is, what a classroom is for these children. Second, changes may favor a somewhat different subset of students. The wisdom from Affect Theory is that teachers need a large arsenal of methods to be employed in a continuous and creative manner. To return to Eisner (1981, p. 176):

> "Teaching is an art in sense that teachers, like painters, composers, actresses, and dancers, make judgments based largely on qualities that unfold during the course of action. Qualitative forms of intelligence are used to select, control, and organize classroom qualities, such as tempo, tone, climate, pace of discussion, and forward movement.

The teacher must 'read' the emerging qualities and respond with qualities appropriate to the ends sought or the direction he or she wishes the students to take. In the process, qualitative judgment is exercised in the interests of achieving a qualitative end.

Teaching requires for its artistic expression routines with which to work; the teacher must have available repertoires to draw on. It is through repertoires or routines that the teacher can devote his or her energies and attention to what is emerging in the class. Without such routines, an enormous amount of energy would need to be spent by the teacher to develop skills to use in the classroom. Thus, the presence of well-developed routines or teaching repertoires enables the teacher to deal inventively with what occurs in class. It is precisely the tension between automaticity and inventiveness that makes teaching, like any other art, so complex an undertaking."

This suggests considerable burdens for preservice and inservice teacher education. Chapman and Snyder (1991) found a significant relationship in Botswana between level of training, from O Level Certificate to postgraduate degree, and some classroom behaviors usually associated with good teaching; however, the relationships are small, correlational, and entail high training costs. Teacher education is extremely important, if our contention about the importance of classroom affect is correct. Higher certification may not be the answer, but considerable skills in the subject area so that it is thoroughly understood by the teacher and wide-ranging method skills in presenting instructional material to promote and maintain a flow of relevant activity appear to be very necessary. From the evidence in the field (e.g., Fuller and Snyder, 1991; Prophet and Rowell, 1990) many teachers need help. The preservice and inservice programs for junior secondary schools in Botswana are new and pressed to contend with the expansion of the system. Under present coping stratagem, it's hard to know if they can meet the challenge.

Third, the substantial relationships among the sets of Interest and Satisfaction variables indicate that classrooms are perceived as either positive or negative places to be. In Botswana, teachers tend to be dominant and vocal, sometimes in 'chalk-and-talk,' but students do recite chorally and answer individual questions even in the most teacher-centered classrooms (Fuller and Snyder, 1991). For whatever reasons, some teachers can enliven their students even though some of these rely upon a domineering pedagogical style, and others just have less success.

We have to be careful here to point out that there are not ideal environments and bad environments and all complexity is not bad. In Botswana, students are selected for continuation in the system. The implication is that only those 'suited' for further instruction receive it; the 'niche' is fixed and filled by those who fit the mold, usually more verbal than other competitors. An opposite reform movement, like that implied in the school effectiveness research, would seek to improve the environments of schools. But, as Cronbach and Snow point out (1981, p. 11):

"The meritocratic selector and the experimental reformer alike missed the point of Darwin's theory. The theory did not posit that **generally** superior creatures evolve. Darwin's scientific writings were invariably concerned with fitness to survive in a **particular** ecology. To foster development of a wide variety of persons, then, one must offer a wide variety of environments. A social reform that would standardize the environment

(whether to fit the average person, or the present elite, or the present proletariat) is inevitably procrustean, conservative, and self-limiting.

The argument that persons can develop in many ways is not to be confused with blurry values that assume every achievement to be worth as much as every other. In actuality, two kinds of social planning will blend in various proportions: (1) Distinct but honored roles are defined, for which different persons are enabled to prepare themselves. (2) Common objectives are identified, to be obtained in the greatest degree possible by all persons, by whatever method is necessary."

Flexibility and adjustment of educational programs to cater for individual learner characteristics increase complexity and cost resources. The complexities must be invisible to the flow of classroom activities, and the costs must be minimized through creative instructional structures and strategies. Until we can identify efficient ways to promote interest for all students, some will fail to get much of value for their many hours in school.

Classroom Variables Associated with Interest

Table II.3 presents the correlations for some non-affect variables and Interest, Enthusiasm, and Attentiveness. High interest was associated with teacher elaboration and use of examples, goal oriented and focused classroom, disciplined, use of small group instruction, accurate and thorough presentation of material, teacher well prepared, classroom organized, logical presentation by teacher, teacher sensitive to student needs, books available, and use of open instructional questions. The interesting classes were also rated as higher overall successes.

Almost a century ago, William James (1899/1983, pp. 67-70), in his *Talks to Teachers,* provided this advice:

"Voluntary attention is thus an essentially instantaneous affair. You can claim it, for your purposes in the schoolroom, by commanding it in loud, imperious tones; and you can easily get it in this way. But unless the subject to which you thus recall their attention has inherent power to interest the pupils, you will have got it for only a brief moment; and their minds will soon be wandering again. To keep them where you have called them you must make the subject too interesting for them to wander again. And for that there is one prescription; but the prescription, like all our prescriptions, is abstract, and to get practical results from it you must couple it with mother-wit.

The prescription is that **the subject must be made to show new aspects of itself: to prompt new questions: in a word, to change.** From an unchanging subject the attention inevitably wanders away.... The genius of the interesting teacher consists in sympathetic divination of the sort of material with which the pupil's mind is likely to be already spontaneously engaged, and in the ingenuity which discovers paths of connection from that material to the matters to be newly learned.

Links and change, coupled with order in the classroom, sound very much like aesthetic **flow.**

Commonly, we search for the primary aesthetic elements from which to build the complexities of emotion. In this received view, affect is a "thing" that is divisible into simpler things,

and even related to distinct anatomical structures. Flow, however, implies that affect is a **relation**, the relation between the properties of aesthetic valuing distributed over the ecology of the perceiver. We do not see affect or any elements of it; we perceive its relations in the context of our interactions with the environment (this view follows those of Reed, 1982, Ghiselin, 1981, and Kugler and Turvey, 1987, on the nature of human action).

Kugler and Turvey (1987) have pointed out the primacy of the flow description in accounts of human actions. Complex systems, humans and their environments, interact primarily through a non-Newtonian paradigm (where Newton's program emphasized force causality) that emphasizes kinematic, geometric, and/or spectral field descriptions that can be termed **informational**. Instead of impact or collision in a force field, there are global morphologies, for example the information available in vision that relates the individual to the environment, and local morphologies, for example specific actions that lead to local disturbances in the global context, like kicking a moving ball while in motion, that provide the basis for synchronized interactions in variable settings and situations. The linkage of affect to the act of perceiving, thus changing somewhat Piaget's noted statement, but not its intent, is to place affect at the boundary of individual-environment interactions. There are global and local forms of information that specify the stable and changing relationships between the self and the world. These invariants and variants afford the individual certain actions, and all perception is accompanied by affect in our valuation of the affordances. We need to identify the macroscopic properties that influence these valuations, particularly in important 'niches' like school classrooms, where the future is prepared.

Discussion

Can we capture the constructs of change, momentum, order, harmony, and tone that seem to make up the affect flow field? There are clues: Roger Barker (1963) outlined some of the constraints of the environment in *The Stream of Behavior*; Edward Walker (1980) presented a theory of psychological complexity and preference within a stream of psychological events; William James (1899/1983) reflected on the continuity and complexities of the **stream of consciousness**; Mihaly Csikszentmihalyi (1975) has offered thoughts about **the flow experience;** and there is a large literature on classroom organization and management that pertains to classroom order and involvement (particularly the work of Walter Doyle, Paul Gump, and Jacob Kounin).

In particular, Doyle (1977, 1980) has specified some of the conditions that seem to prevail in classrooms:

1. **Multidimensionality** – there is a lot of activity in a classroom; at the micro level, there are many different agendas that at the macro level must be coordinated to satisfy the varying interests and circumstantial changes that constitute the direction of the class.

2. **Simultaneity** – many activities seem to be going on all at the same time; the orchestration and attendance to this diversity is difficult for all.

3. **Immediacy** – classroom pace is rapid because of the extensive number of potential and actual interactions.

4. **Unpredictability** – classroom events sometimes go in unexpected directions, particularly given that the teacher-student relationship may be different from time to time and class to class.

5. **Publicness** – there are a lot of people in the classroom that witness and form part of the events and interactions.

6. **History** – the class spends a lot of time together, thus developing a history of interaction that sets norms and delimits the conduct of future activities.

These conditions create constant pressures on the ecology. Flow successfully traverses this environmental quagmire. The problem is that flow is very difficult to legislate.

When we emphasize the flow of classrooms, the spotlight of study quite naturally falls on teaching behaviors. Gump (1967) has documented just how busy teachers are in the classroom. A primary school teacher, for example, carries out about four meaningful acts per minute directed toward students, which results in an extraordinary number per day. He later (Gump, 1969) introduced the notion of **pacing**, and found that student involvement was higher when the class was pulled by the teacher through the work. The teacher's role is clearly very salient to the classroom program. But, the task is complex; they have to monitor many activities (Kounin, 1970) to maintain momentum and flow in the class. How they handle group order and structure appears to be more important than dealing with individual student behavior. As Steinberg and Cazden (1979, p. 265) point out "...perhaps a direct comparison could be made of the change value of focusing on the teacher herself vs. focusing with her on her children." We know a great deal about individual teaching behaviors, and the results for Botswana mirror those from other places (which raises interesting comparative questions given the differences of systems and approaches concerned). The prescribed goal is to put them into a complete theory of context, which entails both the action and affect of the classroom unit. Merging the student and teaching behavior research programs with the experimental aesthetics tradition and direct-realism conceptions of human action may lead to new and useful perspectives on the ecology of the classroom and its effectiveness, not only in terms of scholastic achievement, but also in its other important endeavors of socialization and human development. It's very likely that we can further delineate flow fields in educational settings and will substantiate their importance to schooling, as pointed out by Gudrun Eckblad (1981, p. 119) in the last sentence of her book:

> "It is my experience that people actually know very well what flow is when it is defined for them and that they are pleased when they hear that it is becoming an object of serious scientific consideration."

For Botswana, these results present considerable challenges. Prophet and Rowell (1988), in their ethnographic assessment of the curriculum-in-action in Botswana junior secondary schools, reported monotonous routine in the school life, limited instructional approaches to teaching, emphasis on teacher dominance/student passivity, pervasively poor language skills, and inadequate or inaccurate conceptual development. Fuller and Snyder (1989) confirmed the generality of the Prophet-Rowell observations of impoverished teacher-student interactions, although there were notable variations in the overall pattern. The present results

underline these concerns. Few classrooms in Botswana flow, some are affectively flat, and the majority are marked by low, but excessive complexity.

Instead of order in the classroom, there's routine; instead of intellectual skill development, there's memorization; instead of involvement in learning, there's teacher dominance. This pattern is not unique to Botswana; unfortunately, it's not unusual in Botswana either. With expansion, the pressures and complexities faced by teachers are likely to increase. So is it reasonable to ask where the ideas and support for classroom improvements will originate? School administrators are young and inexperienced, the inservice scheme is new and has only a couple of novice tutors in some subject areas, and the preservice program, from which most of the expanding teaching force will graduate, is of unknown quality. There are some positive signs as well. Greatly increased access and equity have been achieved in a short time with few major systemic disruptions or catastrophes. Basic commitments to educational development were promulgated in the National Commission on Education report in 1977 and the Government's corresponding White Paper in 1978, for which there is continuing consensus on direction and a common educational vision (Meyer and Nagel, 1989). Over the long term, however, the management infrastructure is a hodgepodge of homegrown and donor assisted units, which are understaffed and fractionated, and under considerable pressure to accommodate further expansion and modernization. In other words, the burden is very likely to be borne by local bottom-up strategies, which are unlikely, or interventions by foreign technical assistance projects, which have their own problems (e.g., Nagel and Snyder, 1989).

The benefits of a research program in Botswana are not necessarily an immediate palliative for complex schooling problems. Gains are more long term, if they accrue at all. This set of classroom observation studies is the first systematic and empirical attempt to understand the context of instruction in Botswana. Few instructional innovations in the developing world, in fact, are based on context-specific data. This research provides an empirical grounding for the creation and evaluation of continuing program modifications. The influential National Commission on Education, which carried out its work in 1976, attempted some empirical assessments under the guidance of Commission Chairman, Torsten Husen. Recent collections of educational research (e.g., Crowder, 1984; Yoder, 1989), however, have focused on important macro policy issues or outcomes, ignoring educational process and classroom dynamics. Although full use of the empirical base may have to await mature systemic development, the ideas and theoretical notes may help guide the formulation of an appropriate infrastructure and accompanying program of intervention.

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